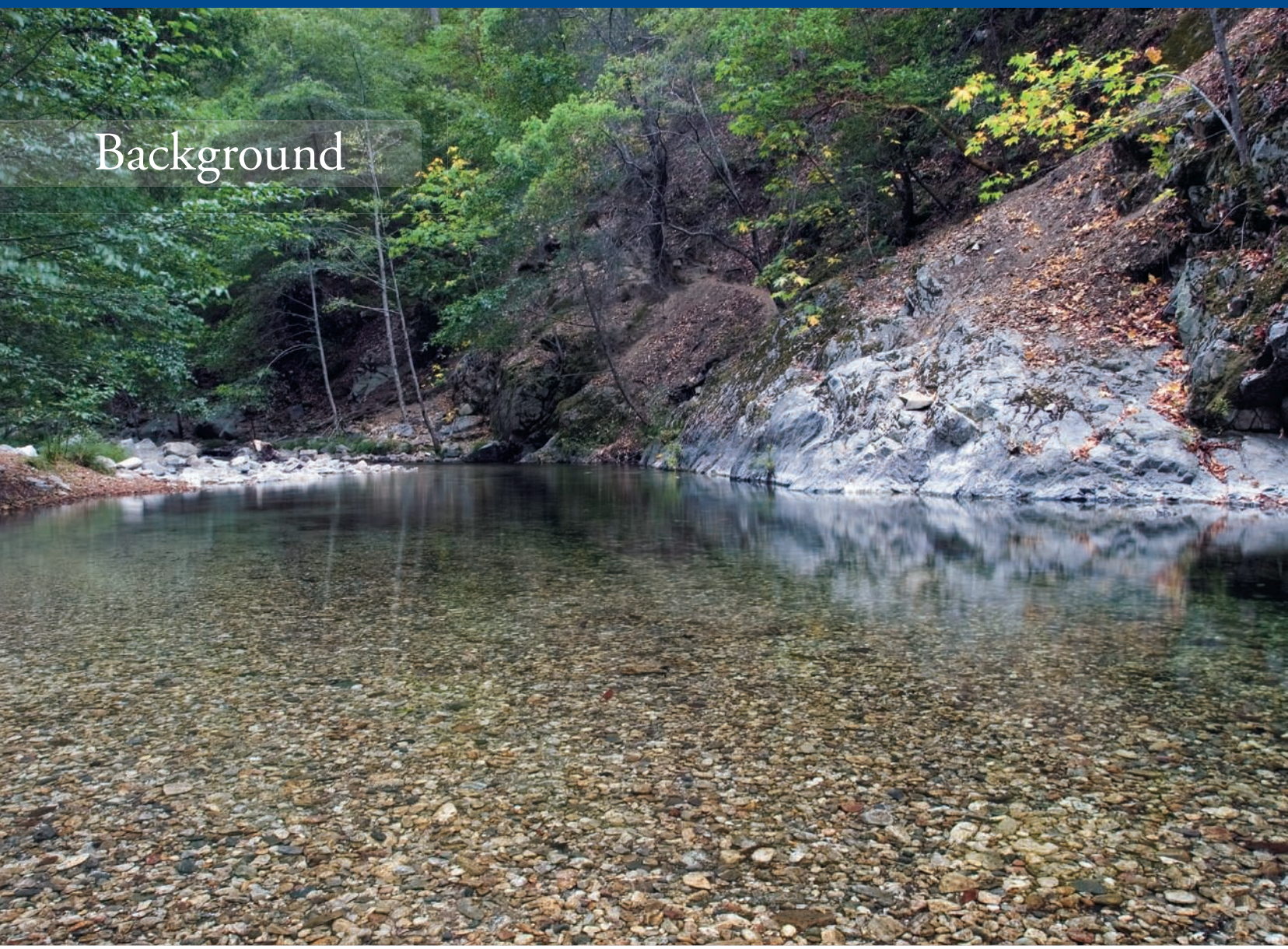
Background



Big Sur River at Sykes Hot Springs

Natural resources surround us at all times in obvious and not-so-obvious ways. An obvious natural resource, the tree outside the window provides shelter from Sun and wind, oxygen to breathe, maybe even food to eat.

The tree also silently participates in the water cycle that brings water for people to drink. It is part of the **natural system**, which consists of the interactions and interrelationships of all living and nonliving things in an immediate habitat and beyond.

All of the products people see and use derive from materials that originate from this natural system. **Consumers** often use these products without considering their relationship to that nearby tree, for example, or to another obvious natural resource. But the connection is direct; none of these products would exist without materials from the natural system, and peoples' use of natural resources and manufactured goods results in a range of effects on the natural system. Consumers influence the extent of these effects with the number and types of goods and services they purchase.

Surfboards

Made from Earth: How Natural Resources Become Things We Use

Throughout the history of human civilization, people have created products from Earth's natural resources to assist with daily activities. Early peoples made tools, containers, weapons, and clothing from rocks, minerals, plants, and animals. Originally, people made these products by hand or through the use of simple tools combined with their own energy (physical labor). In fact, the word "manufacture" comes from the Latin *manu factus*, meaning "made by hand." Early peoples made useable products with raw materials from their immediate surroundings.

By the Middle Ages, complex trade and transportation networks connected civilizations across the African, European, and Asian continents and moved raw materials from one end of the known world to the other. Budding cottage industries produced some of the first modern manufactured goods, such as textiles. The energy of fire and water (burning timber from forests and harnessing the flow of rivers) augmented the energy of men, women, and draft animals (physical labor), enabling the production of such goods.

Today the majority of manufactured goods result from large-scale production in factories, which employ large amounts of energy from a variety of sources and fuels. Manufacturers often build their factories far from the areas where the raw materials used in the **manufacturing** process are harvested or extracted.

In today's global economy the availability of raw materials provides the consumer with a staggering amount of choice among products. But a consequence of having that choice is the exponential increase in the amount of resources required to make a variety of products. The structure of the global economy means that more resources may be used transporting a product to the consumer than in making the product itself.

Five natural resources go into the making of most modern products:

- Fossil fuels: plant and animal remains exposed to great amounts of heat and pressure deep in Earth's crust over millions of years. The major types of fossil fuels used by humans are natural gas, petroleum (crude oil), and coal. Petroleum is the raw material used to make gasoline, plastic objects, and synthetic fabrics.
- Mineral ores: produced over millions of years of heat, pressure, subduction, and layering through the natural rock cycle. Mineral ores provide metals and crystals for tools, jewelry, and electronics. Gold, diamonds, salt, and iron all derive from mineral ores. Mined silica goes into glass, while silicon goes into microchips. Both are found in sand. Sand and gravel have many uses in construction, as do other types of rock.
- Plants: photosynthetic organisms that grow on land or in water. Examples of plants widely used in manufactured products include cotton, kelp, bamboo, pine trees, and corn. People use all or parts of these plants in construction and for food, fabrics, and fuel.
- Animals: living organisms from terrestrial or aquatic ecosystems. Almost all parts of various animals go into producing foods, medicine, and fabric (leather).
- Water: two parts hydrogen and one part oxygen that most often occurs as a liquid. Fresh water goes into agriculture, cleaning and cooling in manufacturing, and many processed foods and drinks.

Bamboo processisng

Argo Mine seepage

Natural resources make their way into human communities from ecosystems around the world. To track resources through the manufacturing process, one must start with the harvesting, extracting, and transportation of the raw materials that go into a product.

Harvesting is the cutting and collecting of natural resources, such as plants or animals. These plants and animals may exist in the wild or be domesticated for agriculture or ranching. Almost all ecosystems on all continents make available plant and animal resources; forests, grasslands, deserts, and marine environments contain all sorts of organisms. The type of animal or plant desired for a particular manufacturing process determines where on Earth harvesters seek their raw materials.

Extraction is the process of digging and removing natural resources from the ground, usually via mining or drilling. Like plants and animals, fossil fuels, mineral ores, and water occur in almost all ecosystems around the globe. The geologic processes at work on Earth make resources available in varying quantities, in different locations, and at different depths in Earth's crust. The type and quantity of the mineral desired determines where in the world extraction takes place.

Because of the global availability of many of the resources desired by manufacturers and designers of finished products, transportation plays a big part in the manufacturing process. People have been transporting resources and goods for thousands of years; first using their own power and then with sleds and carts pulled by animals. Later people began to use sailing ships and other boats. The steam and internal combustion engines, invented in the 1800s, could do ten times the work of animals and in less time. Such engines replaced the sails on ships and the horse on carts. Today's cars, trucks, trains, ships, and airplanes all use a form of internal combustion engine. Since the introduction of this engine, more resources and products travel farther and easier than ever before.

Look at the labels on the clothes you are wearing today; chances are at least one item you are wearing traveled thousands of miles to get to you. But the location on the label only tells where the product was made; the origin of the natural resources used in the product is a different story. After harvesting and extraction, natural resources must be transported to factories for processing or manufacture into a finished product. Finished products from factories also need to be transported to stores, distributors, or other points-of-sale. Transportation has become its own industry. Manufactured ships, cars, trains, trucks, and planes all transport natural resources and other finished products. Raw materials from Earth's ecosystems also go into the construction and operation and these vehicles. Additionally, they require power in the form of fossil fuels to move from place to place.

The raw materials and energy consumed to manufacture and distribute an object or finished product are inputs in the process. The finished product is the main output of the process, though each step also has outputs. These outputs are **byproducts** generated throughout the harvesting and extraction, processing, and manufacturing stages. These byproducts result in habitat destruction, and air, water, and soil pollution, affecting the health of the ecosystems that are ultimately the origin of the raw materials and products that are part of our economies and cultures.

Burning fossil fuels, whether in transportation or in the harvesting, extraction, processing, or manufacturing stages of the process, releases emissions that affect the functioning of natural systems as well as human health. These emissions also cause a buildup of carbon dioxide in the atmosphere, speeding the pace of global climate change. As the climate changes and ecosystems in turn begin to transform, areas of Earth

will begin to look different than they do today. Scientists posit that many of these ecosystems will no longer be able to support the human communities that depend on them.

Water use by human communities and industry alters habitat, interrupts geologic processes, and reduces the amount of fresh water available in an ecosystem. The courses of rivers change when; water from one area gets pumped into another and when people tap and drain underground sources to use the water in the manufacture of certain products. Since water acts as a solvent, manufacturers and extractors often use it to clean and cool machinery during mining, drilling, or manufacturing. When the water mixes with industrial byproducts it can carry toxins—or form new toxins—that make their way through the wastewater system and into other bodies of water. Human communities are developing ways to better treat wastewater to offset or avoid the detrimental effects of these manufacturing uses.

Mining, drilling, logging, and other forms of extraction and harvesting can adversely affect natural systems. The methods used by humans to access resources and raw materials vary to the degree by which they disrupt habitats and pollute. Harvesters and extractors often work to minimize these effects, and in the United States, Europe and other developed countries, governments strictly regulate these practices to minimize these effects. However, removing **non-renewable** parts of any ecosystem or altering the ability of an ecosystem to renew resources that can be replenished inevitably results in a breakdown of that system. Responsible use and practices can help sustain the natural systems that provide the natural resources we depend on, ensuring the continuation of economies and cultures.

Just as designers and manufacturers need to make choices about the inputs and outputs involved in the use of natural resources and the manufacturing process, consumers can seek out finished goods that are produced responsibly.

Recycling natural gas from waste

Glossary

Byproduct: Incidental products or results of human or natural system processes, such as materials remaining after manufacturing.

Consumer: 1. An organism that obtains energy and matter from a natural system such as by eating other organisms 2. One who uses goods or services produced by natural or human social systems 3. One who uses energy resources and in the process, converts an energy source from one form to another.

Extraction: The removal of a natural resource or the separation of a metal from ore.

Harvesting: The gathering, catching, or removal for use, such as crops, fish, or timber.

Manufacturing: The process of making a product on a large scale.

Natural Resources: Materials and material capacities, such as forests, water, and energy reserves, supplied by nature and used by humans.

Natural System: The interacting and/or interdependent components, processes, cycles, and interactions among organisms and their habitats.

Non-renewable resources: Natural resources that are finite and exhaustible. They are not replenished as quickly as they are consumed.

Raw Materials: Natural resources that have not yet been processed or used to manufacture a product.

Unit Planner

	Lesson	Learning Objective(s)	At a Glance
1	**What a Resource!** **Preparation Time:** 30 min. **Instructional Time:** 60 min.	■ Identify the natural origin of the materials used to make common objects. ■ Provide examples of the goods that are produced by natural systems that are used to make common objects used by humans.	Students read about surfboard manufacturing and chart the steps through which natural resources become objects useful to people. They then begin to design toys for manufacture. Throughout the unit students gather addition information about the manufacturing process they can use to further develop their toys.
2	**From Natural Resource to Store Shelf** **Preparation Time:** 20 min. **Instructional Time:** 60 min.	■ Explain the methods used to make common objects (useable products) from natural resources.	Students discuss the design process and evaluate different raw material options and the factors involved making decisions about materials for manufacturing. They make a design blueprint of their toys and indicate the materials they will use for each part.
3	**World Travelers** **Preparation Time:** 15 min. **Instructional Time:** 60 min.	■ Describe the methods used to extract, harvest and transport the materials used to make common objects from natural resources.	Students refer to a world resources map to identify where resources used in surfboard manufacturing come from. They determine travel distances and select methods of transportation for the raw materials and resources in their toy projects.
4	**Meet the Extractors and Harvesters** **Preparation Time:** 15 min. **Instructional Time:** Two 45–60 min. sessions.	■ Describe the methods used to extract, harvest and transport the materials used to make common objects from natural resources.	Students learn about methods used to extract and harvest natural resources by participating in a mock convention in which they mingle and inform each other about their resource-related jobs. They apply this information to their toy project plans.

Made from Earth: How Natural Resources Become Things We Use

Prerequisite Knowledge

Students should know about:
- different natural energy and material resources, including air, soil, rocks, minerals, petroleum, fresh water, wildlife, and forests, and how to classify them as renewable or nonrenewable.

Students should be able to:
- define natural resources (especially rocks, minerals, petroleum, and forests) as materials people use that come from natural systems.

Students should know about:
- natural resources (materials and energy).
- the physical properties of common materials.

Students should have:
- completed the previous lesson.

Students should know about:
- major forms of transportation, including trucks, trains, ships, and airplanes.

Students should be able to:
- use multiplication to calculate distances.
- convert distances in inches to miles on a map (scale).

Students should be able to:
- share information from a reading with other students.

Students should have:
- completed previous lessons.

All Materials Needed

Lesson Toolboxes identify lesson-specific needs.

Activity supplies:
- Calculators: one per student; optional
- Chart-size graph paper
- Index cards
- Markers or colored pencils: a handful per student group
- Name tags or large stickers: one per student
- Rulers: one per teacher; clear plastic
- Timer: one per teacher, with minute and second hands
- Whistle or bell: one per teacher

A-V equipment:
- Overhead projector or LCD projector, screen

Class supplies:
- Colored pencils, construction paper (dark color, white, pink, and yellow), crayons, glue, markers, paper (graph or blank paper, and lined paper), pencils, pens, rulers, scissors, tape, transparency markers, World map

Textbook Alignment

Houghton Mifflin: Unit E Ch. 11: 418-429, 436, 438-441

Macmillan/ McGraw-Hill: Pages 444-456, 458-461

Harcourt: Unit 6 Lesson 3

Holt: SE Pages 127, 132, 134-145, 148-151, 413-415, 426-428

Glencoe: Primary Pages 140. 588-594, 607-608

Prentice Hall: Chapters 2, 7, 11, 12

CPO: TE Pages 278-279, 292

Unit Planner

	Lesson	Learning Objective(s)	At a Glance
5	**The Effects of Consumption** **Preparation Time:** 20 min. **Instructional Time:** 60 min.	■ Provide examples of how the methods used to extract, harvest and transport natural resources, and consume them (or make useable products) affect natural systems.	After viewing and discussing photographs of areas influenced by the manufacturing process, students consider the variety of ways human consumption can influence natural systems, including the creation of air pollution.
6	**What Does It Cost?** **Preparation Time:** 20 min. **Instructional Time:** 60 min.	■ Provide examples of how the methods used to extract, harvest and transport natural resources, and consume them (or make usable products) affect natural systems.	Students return to the surfboard from Lessons 1 and 2 and discuss the inputs and outputs associated with the production of that product. They create an input-output diagram for the toys they are designing.

Prerequisite Knowledge	All Materials Needed	Textbook Alignment
Students should know about: ■ air as a mixture of gases, including oxygen, which many living things need to breathe. ■ the characteristics of desert, forest, marine, grassland, and riparian ecosystems. **Students should have:** ■ completed previous lessons		
Students should have: ■ completed previous lessons		

English Language Development

Lessons in the EEI Curriculum are designed to support students' English language development. The strategies in these lessons are based on some of the practices identified in the Reading/Language Arts Framework for California Public Schools (California Department of Education 2007) and ideas adapted from the San Joaquin County Office of Education's Regional Technical Assistance Center.

To establish successful instructional strategies for all students, the teacher should:

- **Use a wide variety of ways to explain a concept or assignment.** When appropriate, the concept or assignment may be depicted in graphic or pictorial form, with manipulatives, or with real objects to accompany oral and written instructions.

- **Provide assistance in the specific and general vocabulary** prior to the each lesson, using reinforcement and additional practice afterward. Instructional resources and instruction should be monitored for ambiguities and language that could be confusing to students, such as idioms.

- **Ask each student frequently to communicate** his or her understanding of the concept or assignment. Students should be asked to verbalize or write down what they know, thereby providing immediate insight into their thinking and level of understanding. In addition, students should be encouraged to confer about each other's understanding of the concept being taught and the classwork or homework assignments, particularly if the students are not fully proficient in English.

- **Check frequently for understanding in a variety of ways.** When a student does not understand, analyze why.

- **Allow students to demonstrate their understanding and abilities** in a variety of ways while reinforcing modes of communication that are used on standardized tests.

- **Use pacing to differentiate instruction according to students' needs.** Reinforce the more difficult concepts for students experiencing difficulty in the language arts by providing additional time and using the visual aids provided. Accelerate the instructional pace for advanced learners if the assessments indicate mastery of the standard.

The California EEI Curriculum includes a variety of research-based English language development practices, such as:

Vocabulary Development

- Teach difficult vocabulary prior to and during the lesson
- Provide reading, speaking, and assessment tasks that reinforce new vocabulary

Reading Comprehension

- Use grade-level readers, articles, and reading assignments to build comprehension in the content area
- Engage students in meaningful interactions about text
- Provide activities that assess student comprehension and build decoding skills

Writing Strategies and Applications

- Provide opportunities for students to organize ideas and information in a written form including concept maps
- Use stories, articles and other written materials to model good writing
- Provide assessment tasks that allow students to apply their grade-level writing skills

Listening and Speaking Strategies and Applications

- Ask questions to ensure comprehension
- Elicit responses from all students, encourage students to give elaborate responses, and give students time to respond to questions
- Incorporate students responses, ideas, examples, and experiences into the lesson
- Model and teach language patterns needed to understand and participate in the study of the content areas
- Encourage a high level of response accuracy
- Use visual aids, manipulatives, and real objects to support content delivery

The lessons in this unit can be used to support a variety of English language arts skills. This matrix summarizes how each of the lessons can be used to support English language development.

	V Vocabulary	R Reading	W Writing	L Listening	S Speaking
Lesson 1	✓	✓	✓	✓	
Lesson 2	✓	✓	✓		
Lesson 3	✓		✓	✓	✓
Lesson 4	✓	✓	✓	✓	✓
Lesson 5	✓		✓	✓	✓
Lesson 6	✓	✓	✓		✓

Differentiated Instruction

The 2007 Reading/Language Arts Framework for California Public Schools (California Department of Education 2007) provides guidance for helping students with diverse abilities succeed with California's English–Language Arts Content Standards. The instructional units developed for California's Education and the Environment Initiative provide ample opportunities for teachers to differentiate instruction to meet these needs.

It is important to take into account the State Board of Education's and Department of Education's guidance on differentiated instruction while implementing this instructional unit. Page 263 of the 2007 Framework summarizes this guidance as follows:

The diversity of California's students presents unique opportunities and significant challenges for instruction. Students come to school with a wide variety of skills, abilities, and interests as well as varying proficiency in English and other languages. The wider the variation of the student population in each classroom, the more complex becomes the teacher's role in organizing high-quality curriculum and instruction in the language arts and ensuring that each student has access according to the student's current level of achievement. The ultimate goal of language arts programs in California is to ensure access to high-quality curriculum and instruction for all students in order to meet or exceed the state's English–language arts content standards. To reach that goal, teachers need assistance in assessing and using the results of that assessment for planning programs, differentiating curriculum and instruction, using grouping strategies effectively, and implementing other strategies for meeting the needs of students with reading difficulties, students with disabilities, advanced learners, English learners, and students with combinations of special instructional needs.

Procedures that may be useful in planning for universal access are to:

- *Assess each student's understanding at the start of instruction and continue to do so frequently as instruction advances, using the results of assessment for program placement and planning.*
- *Diagnose the nature and severity of the student's difficulty and modify curriculum and instruction accordingly when students have trouble with the language arts.*
- *Engage in careful organization of resources and instruction and planning to adapt to individual needs. A variety of good teaching strategies that can be used according to the situation should be prepared.*
- *Differentiate when necessary as to depth, complexity, novelty, or pacing and focus on the language arts standards and the key concepts within the standards that students must master to move on to the next grade level.*
- *Employ flexible grouping strategies according to the students' needs and achievement and the instructional tasks presented.*
- *Enlist help from others, such as reading specialists, special education specialists, parents, aides, other teachers, community members, administrators, counselors, and diagnosticians when necessary and explore technology or other instructional devices or instructional materials, such as braille text, as a way to respond to students' individual needs.*

Additional information about best practices in differentiated instruction are detailed in Chapter 7 of the Framework.

Traditional Unit Assessment

Description

The **Made From Earth Assessment** (Traditional Unit Assessment Master) helps students demonstrate their understanding of the natural origins of the resources and raw materials used in common objects; the methods used to extract, harvest, and process natural resources; and the effects of creating products on natural systems. In the first section, students identify the natural origin of some common raw materials. The next section asks students to name common products made from four of the natural resources they studied in the unit. Question 10 has students order the basic steps involved in manufacturing, and questions 11 though 14 test students on the methods used to extract, harvest, and transport the materials used in manufacturing. The final question asks students to provide examples of how making a surfboard, the object that started and ended the unit, can affect natural systems.

Advanced Preparation

Prepare Assessment Masters:

- Make copies of Traditional Unit Assessment Master, SM pages 3–5.

Suggested Scoring

Use the Answer Key provided on pages 20–22. The test is worth a total of 40 points.

Preparation Time

15 min.

Assessment Time

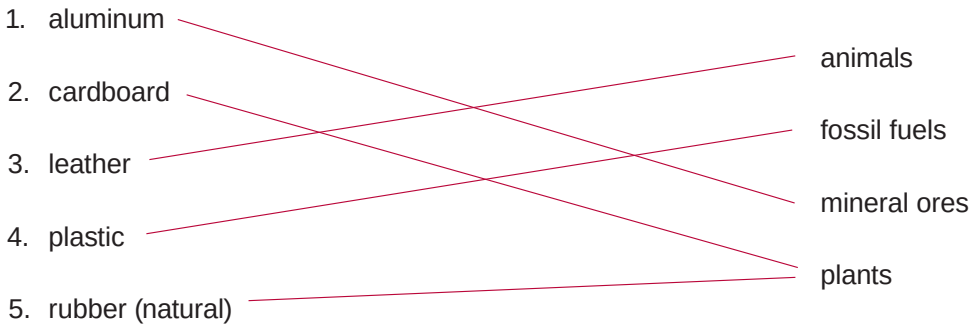
60 min.

Made From Earth Assessment

Traditional Unit Assessment Master | *page 1 of 3*

Name: _____

Matching: Draw lines to match these materials used in common objects to their natural (resource) origins. More than one common object can come from one resource: (2 points each)



Name a product that is made from each of these natural or raw materials: (2 points each)

6. copper *wire, pots, rods, pipes, jewelry, coins, batteries, art*

7. cotton *cloth, clothes, fabric, thread, packing material, batting*

8. petroleum *plastic, gasoline, oil, foam, fuel*

9. silica sand *glass, fiberglass, silicon microchips*

10. These are the steps involved in the manufacturing of an iron pot. Put the steps in the correct order by numbering them from 1 to 4, 1 being the first step. (2 points)

3 Pure iron is transported to a factory.

1 Iron ore is extracted from Earth by mining.

4 The iron is melted and poured into a mold in the shape of a pot.

2 Iron ore is heated and refined to extract pure iron.

Answer Key and Sample Answers

Made From Earth

Traditional Unit Assessment Master | *page 2 of 3*

Name: _____

Multiple Choice: Read each question and circle the letter of the best answer. (3 points each)

11. Which method of transportation is used most by extractors, harvesters, and manufacturers to get materials and products from place to place?
    a. aircraft
    (b.) trucks
    c. trains
    d. ships

12. Which ecosystem is most likely to be a source of wood?
    a. a sawmill
    b. paper
    (c.) a forest
    d. a lake

13. Mineral ores are extracted _____.
    (a.) from Earth
    b. using feller bunchers
    c. from farms
    d. using ships

14. Which of the following is not harvested from plants to make products?
    a. fiber
    b. oil
    c. sap
    (d.) sand

Made From Earth

Traditional Unit Assessment Master | *page 3 of 3*

Name: _____

Short Answer: Answer the question below in one paragraph. (8 points)

15. How can making a surfboard affect natural systems?

The materials that go into making a good surfboard all have to come from somewhere. The petroleum for the foam is extracted from the ground and the area has to be cleared of all plants before drilling. The wood in the surfboard comes from a tree that was cut down from a forest or farm and the fiberglass is made from silica that comes from a mine. That mine made a hole in the ground, but first plants and animals had to be cleared away. The trucks, ships, or trains that carried all materials to the factory all used fuel. The factory used more machines that also used fuel. Burning fuel makes emissions, which can cause air pollution, like smog. The air in all ecosystems needs to be clean for living things to breathe. Building a surfboard may effect ecosystems in a variety of ways.

Alternative Unit Assessment

Description

This alternative unit assessment can be used in conjunction with, or in place of, the traditional unit assessment to demonstrate student mastery of the standard. In this task, students develop an actual model or more detailed blueprint of the toy they have been designing throughout the unit. Students demonstrate all five learning objectives as they complete all parts of their model or blueprint according to the instructions provided. This work should be completed out of class or over one to two class periods by students working independently.

The optional Toy Showcase step offers an opportunity for students to study their classmates' toys and analyze the related inputs and outputs.

Advanced Preparation

Gather and prepare Materials Needed.

Gather and prepare Assessment Masters:

- Make copies of Alternative Assessment Masters.
- Make sure that you have assessed all pages of student **Manufacturing and Design Journals** (individual student's copies).
- Make sure student journals are available to distribute during this activity.

Prepare for the Toy Showcase (optional):

- Secure the use of an area to display students' toy models and blueprints. The area should have both table space and wall space available.
- Invite parents and other classes to view the models and blueprints on display.

Materials Needed

Activity supplies:

- Chart-size graph paper (for blueprints)
- Index cards (for models)

Class supplies:

- Colored pencils, construction paper, glue, markers, scissors, tape

Alternative Unit Assessment Masters:

- **Toy Showcase Instructions**
  SM page 6
  One per student

Suggested Scoring

The rubric on page 24 describes the elements that should be included in the students' toy models or detailed blueprints as well as expectations for student performance.

Preparation Time

15 min.

Assessment Time

To be determined by teacher.

Safety Notes

None

Scoring Tool for Alternative Assessment

Toy Showcase Rubric

Criteria	3	2	1
Knows goods that are produced by natural systems used to make common objects and their natural origin (ecosystem).	Identified the raw material/ natural resource used in each key part of the toy.	Identified some raw materials/ natural resources for some of the parts of the toy; identified products on some parts, rather than raw materials.	Identified few raw materials/ natural resources for parts of the toy; only named the parts and products they were made from (paper, aluminum, etc.)
Can explain and describe methods used to extract and harvest the materials used to make common objects (useable products) from natural resources.	Clearly explained three or more of the basic steps in extracting or harvesting the raw materials/natural resources used in the toy.	Listed at least three of the basic steps used in extracting or harvesting the raw materials/natural resources used in the parts of the toy.	Partially explained a few basic steps in the extraction or harvesting processes for some of the raw materials/natural resources used in the toy.
Can describe the methods used to transport the materials used to make common objects.	Described how the materials used in the toy would be transported (by truck, train, plane, or ship), based on where the materials originated.	Described how the materials used in the toy would be transported, without mentioning or indicating where they originated.	Mentioned that the materials would be moved or transported, but did not say how (truck, train, plane, or ship).
Can explain how the methods used to extract, harvest, and transport natural resources and consume them (make useable products) affect natural systems.	Gave a clear explanation of at least three effects of the making of the toy on natural systems, using Key Vocabulary.	Listed at least two ways the toy might affect natural systems.	Mentioned that the toy uses natural resources, but did not explain how and/or mentioned that making the toy may cause air pollution, but did not explain why.
Organized presentation creatively.	Well organized and creatively presented.	Organized and presented clearly.	Presented, but could have been better organized.

Procedures

Step 1

Tell students that to show what they have learned they are going to develop a model (called a prototype in manufacturing) or a larger, more detailed blueprint of the toy they have been designing. They can use any materials they want to make their models. The materials do not have to be materials students would actually use in a final product; for example, students can use painted cardboard to indicate a toy that would be made out of gold. Remind students that they are making a model *or* making a blueprint—they don't have to do both.

(*Note: Tell students at this point whether they are expected to work on their models and blueprints at home or in class.*)

Step 2

Distribute the **Manufacturing and Design Journals** (individual student's copies) and copies of the **Toy Showcase Instructions** (Alternative Unit Assessment Master). Read over the instructions with the students and answer any questions. Give a deadline for the models and blueprints and have students write the deadline in the space provided on the instructions.

Give students a few minutes to think over whether they will make a blueprint or a model.

Step 3

Provide students with the supplies to draw blueprints or create models of their toys. Have them begin their work using the information in their **Manufacturing and Design Journal**.

Step 4 (Optional)

Upon completion, have students set up their models and blueprints in the area chosen for the Toy Showcase. When all of the models and blueprints are set up, instruct students to circulate around the room to view their classmates' toys. Allow time for students to share positive comments with their classmates.

Once students have seen and commented on each others' work, invite other classes and parents to attend the Toy Showcase.

Toy Showcase Instructions

Alternative Unit Assessment Master

Name: _____

As a new expert in how natural resources become products, your new job is to make a model or detailed blueprint of the toy that your new toy company is going to build.

Your models and blueprints are due at a Toy Showcase on _____.
(deadline date)

Models: If you are making a model of your toy, the model should be the actual size of the toy and include all of the toy's key parts.

Blueprints: If you are making a blueprint, your drawings should be done on chart-size paper, and use measurements to show the size of the actual toy. Like the model, the blueprint should show all key parts of the toy.

All models or the blueprints must be turned in with the following information:

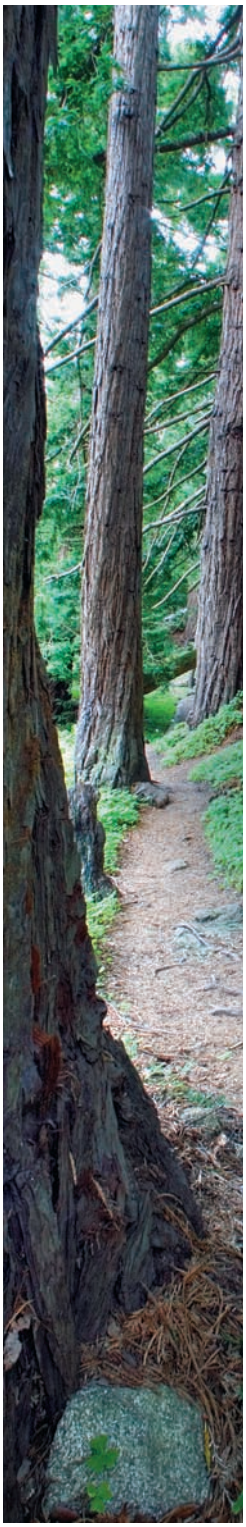
- the name of the toy.
- the **resources** and **raw materials** you are using for each part in the real toy
- the **ecosystems** where those resources and raw materials will come from.
- how those resources will be **extracted**, **harvested,** and **transported**.
- how the making of this toy might **affect** natural systems.

Create tags to stick on your model or make typed labels for the blueprint that have this information on them. You may hand-write or word-process the information on the tags and labels.

Use your **Manufacturing and Design Journal** to help you and do not forget to bring your journal to the Toy Showcase along with your model or blueprint.

Good Luck, Toy Maker!

Extensions & Unit Resources



Extension Ideas

Over the course of a week, have students check objects they own for their countries of origin. Locate these countries on a large world map and have students mark the spots with self-adhesive notes labeled with the names of the objects and the places they were made.

Ask students to inventory the objects they use in one day. Chart each item and conduct research to identify the natural resources required to produce the objects.

Arrange a class field trip to a local home improvement store or lumberyard. Ask where the store gets its lumber and other building supplies it sells. Conduct research to learn more about regulations and guidelines for harvesting lumber in California. Compare to regulations for another state or country. Invite a representative from a mining, petroleum, logging or agricultural company, personnel from one of the eight California Demonstration State Forests (**http://www.fire.ca.gov/resource_mgt/downloads/StateForests2006.pdf**), or the California Forest Products Commission (**http://www.calforests.org/**) to speak in your classroom about methods of extracting and harvesting resources and steps that are being taken to minimize the impact of such on natural systems. Have students prepare questions in advance of the visits.

Have students use an online carbon calculator to compute how much carbon dioxide their consumer activities produce in one year. Explore ways students can reduce their carbon footprints.

Resources for Students

California Air Resources Board. The Air Quality KnowZone for Students.
http://www.arb.ca.gov/knowzone/students/students.htm

Redefining Progress. Adventures with Bobbie Bigfoot.
http://www.kidsfootprint.org

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http://www.storyofstuff.com/

References for Teachers

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http://www.bluewaternetwork.org/reports/cv/Ship_AirPollution_FactSheet_06.pdf

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Environmental Protection Agency. Emission Facts: Average Carbon Dioxide Emissions Resulting from Gasoline and Diesel Fuel.
http://www.epa.gov/otaq/climate/420f05001.pdf

Environmental Protection Agency. Six Common Air Pollutants.
http://www.epa.gov/air/urbanair/6poll.html

Fletcher Chouinard Designs. Environmental Impacts.
http://www.pointblanks.com/enviro.html

Homeblown Surf Blanks and Foam Systems. Our Foam Technology.
http://www.homeblown.co.uk/technology/

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Langone, John. 2004. The New How Things Work. Washington, DC: National Geographic.

McDonough, William and Michael Braungart. 2002. Cradle to Cradle. New York: North Point Press.

McMahon, Ned. "The Case for Polyurethane."
http://www.wetsand.com/article.asp?locationid=5&resourceid=6678&ProdId=0&CatId=847&TabID=0&SubTabID=0

American Petroleum Institute. All About Petroleum.
http://classroom-energy.org/oil_natural_gas/progress_through_petroleum/petroleum/aboutpetroleum01.html

National Oceanic and Atmospheric Administration Earth System Research Laboratory. Frequently Asked Questions.
http://www.cmdl.noaa.gov/infodata/faq_cat-1.html

Phelps Dodge Mining Company. Education: Copper in the Classroom.
http://www.phelpsdodge.com/Community-Environment/EDUCATION.htm

Phelps Dodge Mining Company. Our Mining Process.
http://www.phelpsdodge.com/PhelpsDodgeMining/Copper101/

Surfrider Foundation. Environmentally Friendly Surfboards.
http://www.surfrider.org/a-z/surfboards.asp

Union of Concerned Scientists. Frequently Asked Questions about Global Warming.
http://www.ucsusa.org/global_warming/science/global-warming-faq.html

Wetsand.com. "Homeblown US Announces the World's First 'Green' Surfboard Blanks."
http://www.wetsand.com/article.asp?locationid=5&resourceid=7810&ProdId=0&CatId=849&TabID=0&SubTabID=0

Zronik, John Paul. 2004. Oil and Gas. New York: Crabtree Publishing Company.

Instructional Support

Agencies, institutions, and organizations throughout California have identified themselves as providing programs and materials that support this unit. Links to these resources are available at **http://www.calepa.ca.gov/Education/EEI/instructional_support.html**